THE STANDARD

Noncontact Forces

Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

ANCHORING PHENOMENON

The Paperclip That Jumps

Hold a strong neodymium magnet near a paperclip resting on a table. Lower the magnet slowly. At some distance the paperclip suddenly hops off the table and snaps to the magnet. Nothing touched it before it moved. Students will keep circling back to this all week. What reached across that gap and pulled the paperclip up?

> DRIVING QUESTION
>
> *"What's happening in the space between the magnet and the paperclip that makes the paperclip move?"*

INVESTIGATIVE 1

Iron Filings Reveal the Pattern

Sprinkle iron filings on a piece of paper laid flat over a bar magnet. Tap the paper. The filings shift and line up in arcs flowing from one end of the magnet to the other. The pattern was there the whole time, just invisible. Use this one to sharpen the lens the anchor is pushing on: the space between objects isn't empty, it's filled with a field.

> DRIVING QUESTION
>
> *"Why do the iron filings form a pattern, and what is that pattern showing us about the space around the magnet?"*

INVESTIGATIVE 2

The Balloon and the Water Stream

Turn on a thin stream of water from a faucet. Rub a balloon on a sweater or hair, then hold it close to the stream without touching. The water bends toward the balloon. The stream is moving, the balloon is still, and something is reaching across the air to pull the water sideways. Use this one to sharpen the same lens, only with electric force instead of magnetic.

> DRIVING QUESTION
>
> *"How can a balloon pull on water it isn't touching?"*